The successive order of interaction (SOI) radiative transfer model and its possible applications to radiance assimilation of clouds and precipitation

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Radiative transfer models for global data assimilation purposes have to fulfill stringent requirements in terms of computation speed, memory usage, and accuracy. In a project supported by the Joint Center for Satellite Data Assimilation (JCSDA) we developed a new, fast forward and adjoint radiative transfer model. This so-called successive order of interaction (SOI) model combines the successive order of scattering and doubling techniques to efficiently solve the scattering radiative transfer equation. The work aims at preparing for the assimilation of observed radiances of current and future passive microwave satellite sensors into NCEPs Global Data Analysis System (GDAS) under cloudy and precipitating conditions. Especially in precipitating situations scattering by rain droplets and precipitation-sized ice particles becomes important and has to be considered adequately in the radiative transfer. We will give an outline on the accuracy and speed of the SOI model and show application examples. The model has recently been extended to also work in the infrared spectral range and to account for scattering of cloud droplets. We will present first simulations of high resolution AIRS spectra.

INTERNATIONAL ATOVS WORKING GROUP

Proceedings of the Fourteenth International TOVS Study Conference

Beijing, China
25-31 May 2005